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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/729,582 | 12/06/2003 | Benjamin Jian | AFC-002/RE | 2222 |
| 27652 | 7590 | 07/18/2006 | EXAMINER | |
| JOSHUA D. ISENBERG JDI PATENT 809 CORPORATE WAY FREMONT, CA 94539 | | | PAK, SUNG H | |
| | | | ART UNIT | PAPER NUMBER |
| | | | 2874 | |

DATE MAILED: 07/18/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/729,582

Applicant(s)

JIAN, BENJAMIN

Examiner

Sung H. Pak

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– The MAILING DATE of this communication appears on the cover sheet with the correspondence address –

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 February 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-36 and 39 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 18-29, 34-36 and 39 is/are allowed.
- 6) ☒ Claim(s) 1-17 and 30-33 is/are rejected.
- 7) ☒ Claim(s) 30 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 2/24/06

- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 2/24/2006 has been entered.

Reissue Applications

Prosecution histories of U.S. Patent Application 09/327,826 and 09/995,214 have been carefully reviewed by the examiner, as well as the court opinion *In re Clement*, 131 F.3d 1464, 45 USPQ2d 1161 (Fed. Cir. 1997). After a thorough reconsideration, it is determined that the applicant's argument filed 2/28/2006 regarding the claim rejection based on 35 USC §251 is convincing. Therefore, the rejection of claims 30-35 and 39 under 35 USC §251 is hereby withdrawn.

Terminal Disclaimer

The terminal disclaimer filed on 2/24/2006 disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of U.S. Pat. 6,527,455 has been reviewed and is accepted. The terminal disclaimer has been recorded.

Information Disclosure Statement

Information disclosure statement filed 2/24/2006 has been considered. Please note the initialed copy of the information disclosure statement.

Double Patenting

In view of the properly filed terminal disclaimer, the double patenting rejection of claims 30-36 and 39 is hereby withdrawn.

Claim Objections

Claim 30 is objected to because of the following informalities: line 2 of claim 30 recites, “[photolithographic]”, indicating that the limitation “photolithographic” is removed by the amendment. However, the examiner respectfully submits that any underlining (indicating the addition of limitations) and bracketing (indicating the removal of limitation) in a reissue application **must be done with respect to the original patent, not with respect to the previous amendment.** See MPEP §1453(V)(D)- “Amendment of New Claims”. Pursuant to MPEP §1453(V)(D), all new claims and limitations added to the **original patent** must be underlined, all limitations deleted from the **original patent** must be bracketed, but any limitations added or deleted in an **amendment** in a reissue application must **not** be underlined or bracketed. Instead these changes are to be explained in the Remarks section of the amendment. Appropriate correction deleting “[photolithographic]” is required.

Examiner's Comment

It is respectfully noted that pending claims of the present application contain “product-by-process” limitations (e.g. claims 1, 6, 7, 10, etc.), wherein the “product” claim is limited by the process of manufacturing the product (i.e. “formed by masking and deep reactive ion etching...”, etc.).

As stated in MPEP §2113, “even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process.” In re Thorpe, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985). As such, while the product-by-process limitations are not ignored, such limitations are not given patentable weight unless such limitations inherently impart definite structural features and configurations to the claimed product that distinguishes the claimed product over the prior art.

In addition, it is respectfully noted that it would be improper to import specific limitations from the specification into the claims when interpreting product-by-process limitations (which is true also for any other types of claim limitations). See MPEP §2111. Thus, the pending claims will be given their broadest reasonable interpretation consistent with the specification, without importing limitations from the specification into the claims.

Any and all claim rejections articulated in this office action will be based on this premise.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 7-9, and 30-33 are rejected under 35 U.S.C. 102(b) as being anticipated by Matsuda (US 5,434,939).

Matsuda discloses an optical device with all limitations set forth in the claims, including: a first layer (203) having a socket (216) extending through the first layer and one or more fiber socket sized to receive and align an optical fiber (Fig. 2); wherein one or more fiber socket include two or more sockets (Fig. 3c); wherein a second layer is affixed to the first layer (Fig. 2); said optical fiber having an end section that extends through the fiber socket (Fig. 2); said optical fiber terminating at the end face situated approximately adjacent to the second layer (Fig. 2); said fiber socket aligning and positioning said optical fiber therein (Fig. 2); and a VCSEL device (204, 205, Fig. 2) integrated into said second layer.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-6, 10-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Konishi et al (JP 06-138341).

Regarding claim 1, Konishi discloses an optical coupler comprising: a first layer (5, silicon guide plate), said first layer defining a fiber socket (16); said fiber socket sized to receive and align said optical fiber therein (see [0014]); a second layer (11, transparent substrate) bonded to said first layer (see [0015]); said optical fiber having an end section that extends through the fiber socket, said optical fiber terminating at an end face situated approximately adjacent to the second layer and said fiber socket aligning and positioning said optical fiber therein (Fig. 1). Konishi also discloses that the second layer is transparent substrate.

However, Konishi does not specifically teach that the second layer has the refractive index that is substantially equal to the refraction index of the optical core. When coupling optical beam between an optical fiber and optical element, using a material having refractive index that is substantially equal to the refractive index of the optical core would provide the efficient optical coupling without spreading light beam between the optical fiber and the optical element.

Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to use the second layer with the refractive index that is substantially equal to the optical fiber core in Konishi et al in order to improve the optical coupling efficiency.

Regarding claim 2, Konishi does not explicitly state that the optical fiber is a single mode fiber. Using a single mode optical fiber is well known in the art. Since Konishi teaches making the socket almost equal to the outer diameter of the optical fiber and not specify the types of optical fibers, using any type of optical fiber including a single mode optical fiber would have been obvious to one having ordinary skill in the art.

Regarding claim 3, Konishi discloses that the first layer is a single-crystal silicon layer (see [0009]). Regarding claims 4 and 5, Konishi does not teach that the second layer comprises silicon or glass. It would have been obvious to one having ordinary skill in the art at the time the invention was made to use either a silicon or glass for the second layer in Konishi et al, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice.

Regarding claim 6, Konishi et al teach fitting and adhering the optical fiber in the socket formed in the first layer and pasting the first layer to the second layer. This arrangement provides an epoxy between the optical fiber (first layer) and the second layer. Using the epoxy having an index of refraction that matches the index of the optical fiber in Konishi et al would have been obvious to one having ordinary skill in the art to provide the efficient optical coupling.

Regarding claim 7, as described above Konishi et al teach all the claimed limitations including an optical device (12) integrated into the second layer. Regarding claims 10 and 11, as described above Konishi et al teach the claimed limitations including optical focusing element (12) having focal points approximately situated along the central axes of the fiber socket (see Fig. 1). However, Konishi et al do not teach that the focusing element is a gradient-index lens. A gradient-index lens is commonly used in the art to focus the light beam. Thus, using a gradient-index lens in Konishi et al would have been obvious to one having ordinary skill in the art at the time the invention was made to focus the light.

Regarding claim 12, Konishi et al do not specific teach that the optical fiber is a single mode fiber. Using a single mode optical fiber is well known in the art. Since Konishi et al teach making the socket almost equal to the outer diameter of the optical fiber and not specify the

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types of optical fibers, using any type of optical fiber including a single mode optical fiber would have been obvious to one having ordinary skill in the art.

Regarding claim 13, Konishi et al show a diffractive lens (12, see Fig. 1). Regarding claims 14-17, as described above, Konishi et al teach all the claimed limitations except a third layer bonded to the second layer wherein the third layer comprising an optical device such as a VCSEL or focusing element. Since Konishi et al teaches further coupling of a semiconductor laser (1) and a focusing element (2), using additional layer to accommodate optical device such as VCSEL or lenses in Konishi et al would have been obvious to one having ordinary skill in the art at the time the invention was made to make the device more compact and easier to align.

Allowable Subject Matter

Claims 18-29, 34-36, 39 are allowed.

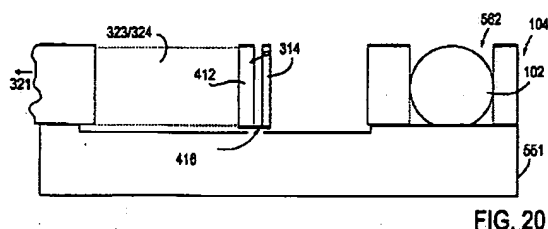
The following is a statement of reasons for the indication of allowable subject matter:

A method of forming a multilayer optical fiber coupler is well known in the art. Such method, wherein one or more cylindrical optical fiber sockets being formed on a substrate via photolithographic technique is also known in the art (please refer to prior Office Actions). However, none of the prior art fairly teaches or suggests such method of forming a multilayer optical fiber coupler, wherein the cylindrical optical fiber socket is formed through the substrate layer via deep reactive ion etching, as claimed in the instant application. As discussed in the applicant's remarks filed 2/24/2006, deep reactive ion etching is materially different process compared to prior art reactive ion etching process. While using deep reactive ion etching to form cylindrical optical fiber socket is now known and described in numerous patent and non-patent

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literature in the current state of the art, none of the prior art fairly teaches the limitations discussed above.

The earliest prior art that discusses the use of deep reactive ion etching for forming optical fiber alignment structure is Hurst, Jr. et al. (US Pat. 6,360,035 B1). Figure 20 of Hurst reference is reproduced below.



In column 20 lines 9-20, Hurst explicitly teaches the use of a deep reactive ion etching for forming an alignment groove (562) precisely formed to accept an optical fiber (102) therein. However, Hurst fails to teach or suggest forming a cylindrical alignment fiber socket extending through the substrate as claimed in the instant application.

Response to Arguments

Applicant's arguments for patentability of pending claims set forth in the amendment filed 2/24/2006 has been carefully studied by the examiner. Likewise, applicant's affidavit filed under 37 CFR 1.132 regarding commercial success of the claimed product, as well as the affidavit regarding the long-felt need recognized in the industry which was satisfied by the claimed product have been carefully studied by the examiner.

Applicant's arguments, in combination with the affidavits filed under 37 CFR 1.132, are deemed persuasive with regard to pending method claims (i.e. claims 18-29, 34-36, 39).

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However, the examiner respectfully submits that the product claims of the present application remain unpatentable and the applicant's arguments for patentability are not convincing.

Applicant's detailed discussion of differences between reactive ion etching and deep reactive ion etching (page 17 of amendment filed 2/24/2006) is much appreciated by the examiner. Specifically, the applicant argues that deep reactive ion etching is different because it "enables the fabrication of sub-micron precision fiber sockets suitable for at single mode fiber alignment..." (last paragraph, page 17) whereas, "ordinary RIE process are used to etch only a few micron to maybe twenty microns in the extreme case..." (last paragraph, page 17), and that "[ordinary RIE] would take unreasonably long time to etch through a silicon substrate, even if there were no problem with re-deposition" (page 18).

However, the examiner respectfully submits that the product claims of the instant application merely recites, "... fiber socket formed by masking and deep reactive ion etching..." without any limitations drawn to substrate thickness, etch depth, etching speed, or any other specifics that would structurally distinguish the claimed product patentably distinct from the fiber alignment sockets of the prior art. Therefore, the claim rejection based on the prior art fiber alignment sockets formed on silicon substrates is proper.

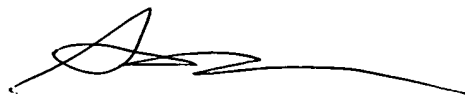
Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sung H. Pak whose telephone number is (571) 272-2353. The examiner can normally be reached on Monday- Friday, 9AM-5PM.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rodney Bovernick can be reached on (571)272-2344. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Sung H. Pak
Primary Patent Examiner
Art Unit 2874